

## SECTION 1 INTRODUCTION

### 1.1 BACKGROUND

Wind profiler radar systems provide hourly (or more frequent) wind speed and direction values as a function of altitude. The primary role for wind profilers is in weather observation and forecasting; however, other applications have been identified, including severe wind condition warnings, flight planning, space shuttle support, and pollution studies (acid rain and volcanic ash). Currently, wind speed and direction are determined by the National Weather Service (NWS)<sup>a</sup> and other agencies by tracking the flight path of radiosondes, which also provide information on temperature, barometric pressure, and relative humidity in the atmosphere along their flight paths. Radiosondes are expendable and are usually released twice daily. Although wind profilers are not direct replacements for radiosondes, they will provide regular, more frequent wind observations.

Wind profiler operations to date have been for experimental purposes at several research facilities. In addition, the National Oceanic and Atmospheric Administration (NOAA)<sup>a</sup> currently operates a demonstration network of 31 wind profilers and plans a national network of 100–200 units. Other Government [i.e., Department of Defense (DOD)] and non-Government wind profiler users are expected.

A concern about wind profiler operations is the selection of appropriate operating frequency bands. Atmospheric propagation characteristics require that wind profiler systems operate in the 50–1000 MHz range. Currently, three frequency ranges are of particular interest: around 50 MHz, 200–500 MHz, and around 900 MHz, each of which best accommodates a particular application. Since the NOAA plans a 200–500 MHz national wind profiler network, efforts to accommodate wind profilers have focused on that band.

No single frequency band is presently available to accommodate the 200–500 MHz type wind profiler operations for all users, Government and non-Government. Furthermore, the selection of any frequency band must take into account any potential international effect. For example, the wind profiler developed for NOAA at 404.37 MHz may be sold by its manufacturer to other countries, where conscientious attempts to protect operations such as COSPAS (COsmicheskaya Sistyema Poiska Avariynych-Russian Federation acronym for Space System for Search of Distressed Vessels) and SARSAT (Search And Rescue Satellite-Aided Tracking system) operating in the 406–406.1 MHz band may not be made. In addition, a frequency band selected solely on the basis of national usage may not be suitable for international usage, and thus national trade may be adversely affected. As a result, the Interdepartment Radio Advisory Committee (IRAC) requested that the National Telecommunications and Information Administration (NTIA)<sup>a</sup> conduct an assessment of the 216–225 MHz, 400.15–406 MHz, and 420–450 MHz bands to assist in determining the appropriate part of the spectrum for midfrequency (200–500 MHz) wind profiler radar operations.

---

<sup>a</sup> Agencies within the United States Department of Commerce (DOC).

The requested study was completed by NTIA.<sup>1</sup> The study recommended that the 440–450 MHz band be considered for long-term wind profiler operations. It was noted that only limited wind profiler measurements had been conducted, and additional measurements would aid in verifying some of the assumptions made in the NTIA study. The test plan for these measurements was coordinated with NTIA's Institute for Telecommunication Sciences (ITS), NOAA, and various IRAC agencies.

The measurements were conducted on the Unisys wind profiler in Platteville, Colorado, operating on 404.37 MHz. It is assumed that the characteristics associated with the 404.37-MHz profiler would remain the same for profilers in the 200–500 MHz range, independent of any new frequency chosen.

## 1.2 OBJECTIVES

The objectives of the measurements on the Unisys wind profiler are as follows:

1. Determine the radiated short-pulse and long-pulse emission spectra of the wind profiler;
2. Determine the amplitudes of the wind profiler's radiated harmonics and subharmonics relative to the center frequency amplitude;
3. Determine any filter characteristics associated with the antenna;
4. Determine the gain of the profiler antenna at ground level relative to an isotropic antenna;
5. Determine the susceptibility of the profiler to various waveforms that represent typical systems operating in the 440–450 MHz band; and
6. Determine the effects of wind profiler emissions on a receiver that would represent typical land mobile/amateur operations.

---

<sup>1</sup> Patrick, G. and Richmond, M. (1991), Assessment of Bands for Wind Profiler Accommodation (216–225, 400.15–406, and 420–450 MHz Bands), NTIA Report 91-280, September 1991.

**1.3 APPROACH**

To meet the above objectives, a preliminary measurement plan was developed and coordinated between NTIA/ITS, NOAA, and various IRAC agencies.<sup>2</sup> The plan was implemented in a series of measurements and tests on the profiler at Platteville, Colorado, in 1991.

---

<sup>2</sup> NTIA/ITS, RSMS Measurement Plan on the Unisys wind profiler, May 1991.